Addendum A

Subject Matter support for Claims 61 and 84

The following two independent claims are fully supported within the specification of the original continued application number 09/197,219, filed on Nov. 20, 1998, now Patent No. 6,567,116:

Claim 61. (New) An automated system for controlling some combination of at least the pan, tilt and/or zoom controls of one or more second movable cameras as they video the activities of one or more objects in a predefined area, where the control signals directing the second movable cameras are automatically generated without user intervention and based upon computer analysis of video images captured by one or more first stationary cameras that together form a contiguous and continuous view of the same area, comprising:

a first set of stationary cameras for generating a first video stream of images that together form a contiguous and continuous view of the predefined area;

a first algorithm operated on a computer system responsive to the first stream of video images for analyzing those images to first determine the relative X, Y coordinates and the dimensional characteristics of at least the size of each object within the predefined area and for forming a tracking database representative of each object's coordinates, movements and dimensional characteristics, and

a second set of movable cameras responsive to the tracking database, wherein each movable camera is automatically directed without user intervention to maintain an independent view of one or more objects within the predefined area and where the second set of movable cameras continuously outputs a second stream of video images.

Claim 84. (New) A method for controlling some combination of at least the pan, tilt and/or zoom controls of one or more second movable cameras as they video the activities of one or more objects in a predefined area, where the control signals directing the second movable cameras are automatically generated without user intervention and based upon computer analysis of video images captured by one or more first stationary cameras that together form a contiguous and continuous view of the same area, comprising the steps of:

capturing a continuous first stream of video images using a first set of stationary cameras, wherein the images together form a contiguous and continuous view of the predefined area;

detecting the X, Y coordinates and dimensional characteristics of at least the size of each object relative to the predefined area using computer based image analysis of the first stream of video images;

using the detected X, Y coordinates and dimensional characteristics regarding each object to automatically and individually direct some combination of at least the pan, tilt and/or zoom movements of a each camera in a second set of one or more movable cameras without the aid of an user, and

capturing a continuous second stream of video images using the second set of automatically movable cameras, wherein the images create independent views of one or more of the objects within the predefined area.

With respect to the first element of the apparatus (and method) claim above, namely: "A first set of stationary cameras for generating a first video stream of images that together form a contiguous and continuous view of the predefined area," the following specifications from Patent 6,567,116 B1 are sited as proper antecedent basis:

Col 10: lines 40-44 state:

"Referring to **Fig. 1** there is shown a top view drawing of the preferred embodiment of the Multiple Object Tracking System 100. System 100 comprises an array of overhead x-y camera assemblies **20c** that individually track all object movement within a fixed area such as **20v**."

Col 11: line 65 – Col 12: line 3 states:

Referring now to **Fig. 3a** there is shown a first embodiment of the overhead x-y tracking camera assembly **20a**. In this embodiment, assembly **20a** has been limited to tracking camera **24** (without energy filter **24f**) which is enclosed within assembly casing **21** and has a view to the ice surface **2** below through assembly Plexiglas **21a**.

Col 12: lines 9 – 14 state:

"Referring now to **Fig. 3b** there is shown a second embodiment of the overhead x-y tracking camera assembly **20b**. In this embodiment, assembly **20b** has been augmented to include energy source **23** that emits selected energy **23a** which radiates down onto the objects moving upon the ice surface such as player **10**, puck **3** and stick **4**."

Addendum A

Subject Matter support for Claims 61 and 84

Col 12: lines 21 – 25 state:

"Referring now to **Fig. 4a** there is shown a third and the preferred embodiment of the overhead x-y tracking camera assembly **20c**. In this embodiment, assembly **20c** has been augmented to include filming camera **25** that captures unfiltered images of all movement on the ice surface below."

Col 13: line 13 – Col 14: line 9 states:

"Mounting frame **50** has been designed to variably attach to rink girders **2d** in such as way that the subsequently attached array of overhead assemblies **30c** forms an overlapping field of view across of the ice surface **2** below. It is preferable that each assembly **30c** maintains a perpendicular position with respect to surface **2**. It is anticipated that either fixed lenses with pre-selected depths of field or electronically controllable zoomable lenses will be used to properly establish the overlapping fields. The overlap is important to ensure that any object to be tracked can be followed from camera to camera as it moves throughout the predefined area."

With respect to the second element of the apparatus (and method) claim above, namely: "a first algorithm operated on a computer system responsive to the first stream of video images for analyzing those images to first determine the relative X, Y coordinates and the dimensional characteristics of at least the size of each object within the predefined area and for forming a tracking database representative of each object's coordinates, movements and dimensional characteristics," the following specifications from Patent 6,567,116 B1 are sited as proper antecedent basis:

Col 17: lines 48-64 state:

"This extracted surface as defined by **10r**, as well as the tracked location of each reflective object within that surface is then passed to composition of multiple overlapping images into individual full view frames unit **65**. Unit **65** then catalogues into one complete set all detected reflective objects such as **3b**, **4b**, 7**m** and **9a** and their corresponding extracted object pixels that have been detected over the entire field of view. As a matter of practice, the extracted pixels will be expressed as the minimum-bounding rectangle as depicted by **10r** rather than a list of pixel coordinates. Within this minimum bounding rectangle, all background pixels will have been set to a null value by extraction unit **64** to clearly differentiate them from the foreground object during later examination. A center of gravity as well as polar coordinates to that center point are also calculated by Extraction Unit **64** and passed to composition unit **65**."

Col 18: lines 7-18 state:

"Once the composition unit **65** has created the known set of polar coordinates to the centers of gravity for all know reflective markings and their corresponding objects and has also defined the minimum bounding rectangles and a beginning edge point

this entire set of data is passed to the storage of tracking and video frames indexed by object and frame no. / time sequence unit **67**. As the entire set of frames across the field of view created by the array of overhead assemblies **20c** and perspective sets **30** are continually input by capture units **61** they will be passed to tracking unit **62** which will follow each new object as it enters the field of view **20c1** and ultimately leaves via the same assembly **20c1**."

With respect to the third element of the apparatus (and method) claim above, namely: "a second set of movable cameras responsive to the tracking database, wherein each movable camera is automatically directed without user intervention to maintain an independent view of one or more objects within the predefined area and where the second set of movable cameras continuously outputs a second stream of video images," the following specifications from Patent 6,567,116 B1 are sited as proper antecedent basis:

Col 10: line 66 – Col 11: line 7 states:

"And finally there are automatic filming cameras **40** which are constantly being directed to the center of play as represented by player **10** who is currently controlling puck **3**. Automatic filming cameras **40** are in continuous communications with and are receiving their directions from local computer system for video processing and analysis **60**. System **60** itself is also in continuous communications with array of overhead x-y tracking camera assemblies **20c** and perspective z tracking camera sets **30**."

Col 15: lines 19-30 state:

"Also optional and yet novel to the present invention is the inclusion of automatic filming cameras **40** at discretionary locations within ice surface arena **2**. Heretofore, camera operators who intuitively determined the center-of-play controlled the filming for broadcast of events such as hockey and self directed the pan, zoom and tilt of their filming cameras to capture the restricted scene. Now that system 100 will have all information concerning the movement of objects on the ice surface **2**, it is planned that local computer system **60**, via its center-of-play / choice of view analysis unit **66**, will automatically direct the pan, zoom and tilt of the automatic filming cameras **40**."

Furthermore, the following specification from Patent 6,567,116 B1 teaches elements one through three:

Col 13: lines 9 – 60 state:

"Referring now to **Fig. 8** there is depicted a block diagram of the entire system. With respect to overhead x-y tracking camera assembly **30c** there is shown additional optional rf modem **25m** which may be used in place of wire **26** (not depicted) to link

filming camera **25** to local computer system **60**. Also shown is additional optional RF modem **24m** which may be used in place of wire **26** (not depicted) to link tracking camera **24** to local computer system **60**. Likewise additions are also depicted for perspective z tracking camera sets **30**. Local system **60** has been broken down into its constituent block parts starting with the video capture for tracking camera(s) unit **61** which accepts input from all tracking camera(s) **24** mounted within overhead assemblies **30c** or perspective sets **30**. Capture unit **61** then feeds its data stream to indicia / object tracking analysis unit **62**. In time parallel operation there is shown video capture for filming camera(s) unit **63** which accepts input from all filming camera(s) **25** mounted within overhead assemblies **30c** or perspective sets **30**. Capture unit **63** then feeds its data stream to object / scene extraction analysis unit **64**. Unit **64** also receives simultaneous input from indicia / object tracking analysis unit **62**. Both extraction analysis unit **64** and tracking analysis unit **62** simultaneously provide their data streams to composition of multiple overlapping images into individual full view frames unit **65**. Unit **65** also receives conditional input from portable tracking control device **90** and provides its data stream to both center-of-play / choice of view analysis unit **66** and storage of tracking and video frames indexed by object and frame no. / time sequence unit **67**. Choice of view analysis unit **66** in turn provides real time directives to automatic filming cameras **40** through conventional wire or optional RF modem **45m**. Such directives are then input to computer directable event filming camera **45**. Filming camera **45** then feeds its data stream back to storage and tracking unit **67** via conventional wire or optional RF modem. Unit **67** subsequently provides its data stream to quantification and analysis of object movement stored in cross-linked database unit **68**. Unit **68** optionally conducts two-way communications with portable tracking control device **90**, team output stations **80** and remote computer system for reviewing captured events **70**. The optional link with device **90** will be made via Rf connection (not depicted) while the link with remote system **70** will be made via remote communications devices **69** and **79**. The information provided by local system **60** to remote system **70** will be provided to the end user via remote access to stored database of tracking and filming frames as well as object movement quantification and analysis unit **71**."